REPORT OF WORKSHOP

ON

RESPIRATORY EFFECTS OF INVOLUNTARY SMOKE EXPOSURE: EPIDEMIOLOGIC STUDIES

May 1-3, 1983

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service
National Institutes of Health

December 1983

2023279655

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

FOREWORD

On May 1-3, 1983, the Division of Lung Diseases, National Heart, Lung, and Blood Institute sponsored a Workshop on Respiratory Effects of Involuntary Smoke Exposure: Epidemiologic Studies, which was held in Bethesda, Maryland. Twenty-one investigators from the fields of epidemiology, statistics, and adult and pediatric pulmonary medicine participated. This report, prepared by the workshop chairman, session recorders, and Division of Lung Diseases staff, summarizes the presentations and makes recommendations for future studies.

2023279656

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

TABLE OF CONTENTS

2023379657

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

1

INTRODUCTION

The 1979 Surgeon General's Report on smoking and health presented the available scientific evidence that links involuntary cigarette smoke exposure (passive smoking) to adverse health effects. Existing evidence suggests that children of parents who smoke have more bronchitis and pneumonia during the first year of life and that acute respiratory disease accounts for a higher number of restricted activity days and bed disability days in children whose families smoked than in those whose families did not. In adults, small airway function impairment equivalent to that observed in light smokers has been reported in adults who had never smoked or, lived with smokers but were only exposed to cigarette smoke in the work place. Results such as these need to be confirmed and validated. A number of studies involving large population groups are presently addressing the question of the effect of passive smoking on the respiratory system. However, these studies which are being carried out by at least three different groups, are employing different populations and methodologies and have led to varying conclusions.

An important goal of this workshop was to provide a common forum to these different groups of investigators, along with statisticians conversant with this area, so that the various study designs and results obtained so far could be reviewed in order to identify the probable reasons for differences. Other goals of the workshop were to develop guidelines for collection and analysis of epidemiologic data on the respiratory effects of passive smoking, and to make recommendations for future studies.

The participants included epidemiologists involved in three ongoing population studies of the effect of passive smoking on respiratory health, statisticians, and adult and pediatric pulmonary physicians. The presentations (see Appendix A for agenda) dealt with data from the three groups and methodologic issues relating to data collection and statistical analysis, as well as results of other relevant studies carried out both in the US and other countries. After the first day of formal presentations, the workshop participants (see Appendix B for the list of participants) were divided into smaller task groups, each of which addressed the issues of measuring smoke exposure, outcome variables, confounding variables, other statistical issues related to design and analysis, and the need for additional studies. The following is a summary of the presentations, discussions and recommendations of the task groups.

2023379658

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

II

COMMUNITY-BASED STUDIES ON THE PULMONARY EFFECTS OF PASSIVE SMOKING

Findings from community studies of the effect of passive smoking on the respiratory system were summarized. These presentations included data from populations in East Boston, Massachusetts, the Six Cities Study, Tucson, Arizona, and Tecumseh, Michigan. Although none of these studies were originally designed to address the question of the effect of passive smoking on the respiratory system, all have succeeded in obtaining a considerable amount of relevant data.

The methods of data collection and data analysis are somewhat different from group to group, and the results and conclusions of the studies also showed differences. All of the studies have been using questionnaires to assess exposure and symptom prevalence and, in general, the one second forced expiratory volume (FEV_1) has been used as the lung function outcome variable of interest.

Most of the available data that have been analyzed are cross-sectional in nature; longitudinal data from a cohort followed for seven years in East Boston, Massachusetts, have been published since the workshop. In the cross-sectional community-based population studies, the effect of passive smoking on lung function varied from none to a very small effect (0 - 3% loss in FEV_1). In the longitudinal study, a measurable effect on the development of pulmonary function was seen in the children with a mother who smoked throughout the child's life. Whether this reflects a postnatal effect of passive smoking on lung growth and development, an *in utero* effect or an effect on bronchial reactivity such that some individuals exposed to passive smoking develop an increase in bronchial reactivity, an increase in mucus in the airways, increased susceptibility to lower respiratory tract infection or some other as yet undefined effect is not yet clear. Better measures of exposure, more longitudinal data and more information about bronchial reactivity are needed before this can be resolved. Better measures of exposure will probably involve biological monitoring, for example, the measurement of cotinine in biological fluids such as saliva and urine. The size and complexity of the data sets accumulated in these population based studies have necessitated the development of new analytical techniques and the adaptation of existing techniques to apply to both cross-sectional and longitudinal data.

III

METHODOLOGIC CONSIDERATIONS

The relatively small differences in the effects found in the various studies discussed at this workshop may be real and represent true differences among the various communities studied in the measurable effect of involuntary smoke exposure. Such differences may be caused by regional and geographic

2023279659

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

variations in levels of indoor air pollution that might result from differences in housing - (e.g., well insulated versus poorly insulated houses,) and life style (e.g., predominantly indoor living versus predominantly outdoor living.) On the other hand, the differences may also be due to methodologic differences in data collection and/or analysis and in the way in which potentially confounding variables have been handled.

The difficulty of controlling for potentially confounding variables was recognized. Such variables include: 1) unvented combustion products from different kinds of stoves used for both heating and cooking, e.g., gas, wood and kerosene, 2) other indoor pollutants such as formaldahyde and respirable particulate matter, 3) indoor pollutants of organic origin such as pollens, molds, mites, other allergens and infectious organisms, 4) characteristics of indoor environments such as temperature, humidity, and frequency of air exchanges, 5) socio-economic status, culture (ethnic), and such factors as crowding, number of siblings, household conditions, child care, reporting biases, etc., 6) demographic and medical characteristics of the study population such as age, sex, marital status, the presence of underlying respiratory conditions, atopy, infections, disability and/or co-morbidity, 7) parental symptoms such as productive cough which will affect reporting, 8) maternal smoking during pregnancy, 9) annoyance responses and other psychological or social responses to tobacco smoking in a nonsmoker. Extensive as this list of potentially compounding variables may be, the importance of taking them into consideration in the study design and analysis cannot be overemphasized.

Given the complexity and number of the potentially confounding variables, the importance of analyzing all the data sets using a common statistical approach was recognized. Also, the importance of distinguishing a statistically significant difference between groups from a clinically significant difference was emphasized. In this regard, a small difference (e.g., 1-3% in FEV_1) in a cross-sectional study between children from homes in which one parent smoked and those from homes in which no one smoked, might be statistically significant but not be of any clinical significance. On the other hand, a 7% difference in rate of increase in FEV_1 over 7 years observed longitudinally may be both statistically and clinically significant. It is therefore important to use outcome variables (such as FEV_1) which are of clinical importance rather than using other lung function tests which are extremely sensitive. Likewise, longitudinal data are generally more useful and informative than cross-sectional data.

Many of the differences among the many population studies which have looked at the effect of active and passive smoking on the lung function may be attributable to exposure and/or dose. The logistical difficulties in adequately monitoring these variables are recognized as is the need to develop techniques which are able to measure the biological burden of tobacco smoke. In the future it is likely that considerably less attention will be paid to indirect measures of exposure such as area and personal samplers and more attention paid to biological markers of exposure.

2023379660

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

IV

CONCLUSIONS OF WORKING GROUPS

A. Study populations

None of the population studies already under way was designed specifically to look at the effect of passive smoking on the respiratory system. However, if the results from these studies show consistency, it may be possible to arrive at answers to most of the questions about the effects of passive smoking on the lungs. Existing data sets should be analyzed and the results compared before any further studies are designed to address this question. An exception to this might be for the age group 0-5 years for which there is very little existing information or planned study because of the difficulties inherent in obtaining accurate measures of lung function in this age group. Also of particular interest are the changes taking place in lung function during the transition between the late teen years and early twenties and the decline in lung function in early adult life. There is presently insufficient information about the possible effect of risk factors such as passive smoking on this transition phase. Another area of particular interest is the occupational setting. It may be that passive smoking is more hazardous in certain occupational settings than in others.

B. Outcome Variables

The usual measures of outcome that are presently employed are 1) some measure of lung function and 2) questionnaire information. Every attempt should be made to obtain information in a standardized fashion, (as is presently being done in most of the ongoing studies). Since there are differences of opinion as to which measure of volume or flow should be regarded as the "best" measurement, it is recommended that the complete flow-volume or volume-time curves should be saved. In addition, more attention should be paid to obtaining information about airway reactivity since the existing evidence suggests that exposure to passive smoking may alter an individual's airway reactivity. Also, there is an urgent need to develop pulmonary function tests for use in very young children (below five years), with particular attention to linking these tests with those for older age groups.

Most groups are presently using the standardized ATS-DLD respiratory symptom questionnaire to define symptoms and disease states. It should be noted that this questionnaire was developed to define disease states such as chronic bronchitis and, therefore, may not be entirely suitable to elicit the symptoms associated with passive smoking. Likewise, the pediatric questionnaire was not developed with the idea of identifying symptoms associated with passive smoking. It is recommended, therefore, that new questions should be designed to add to both the adult and the pediatric question-

2023329661

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

naires to obtain information, in a standardized fashion, about involuntary smoke exposure.

C. Measurement of Dose/Exposure

Lack of proper attention to the estimation or measurement of exposure is a major weakness of all the studies carried out so far. Direct measurement of exposure to tobacco smoke and other combustion products is, at present, too difficult to consider in population studies. It is possible, however, to significantly improve our estimates of exposure. This can be done by developing standardized questions for characterization of indoor sources of pollution, including smoking and by using passive monitors to estimate average ventilation within buildings. Probably most important is the evaluation of biological monitors, in particular, urinary and salivary cotinine levels as indicators of levels of exposure to tobacco smoke.

D. Confounding Variables

There are many potential confounding variables which must be taken into account. Data on these variables are not presently being collected uniformly among the studies underway. It is hard to recommend any specific strategy with regard to confounders, but it must be emphasized that any study which ignores them will be seriously flawed. A list of potentially confounding variables is provided in Section III.

Atopy is important to measure, but cannot be determined by questionnaire data. Only skin tests and IgE measurements are appropriate at present. The development of a standardized approach to measuring the atopic status of an individual should be undertaken.

E. Other statistical issues in design and analysis

The investigators agreed that the various study groups should attempt to cross validate results using analytic techniques from other studies on their own data. Existing statistical methods plus the adaptations of existing methods that have been developed provide a good starting place. In certain instances new methods will still need to be developed. For each study and data set, it is important to place confidence limits on the results, evaluate them in the light of possible biases specific to that study and interpret the results in terms of whether they are clinically and biologically meaningful as well as statistically significant.

F. Additional studies

The participants concluded that the existing studies and data sets should be explored extensively and the results of the various studies compared in order to see if an agreement on the effect of passive smoking on the respiratory system may be reached by the various investigators. Following such an analysis, it will probably be clear as to whether new studies need to be designed to answer specific questions.

2023379662

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

It may also be worthwhile to explore other existing data sets which may have obtained information about exposure to passive smoking such as MRFIT, Framingham, the UK National Birthday study (1952), the Japanese (Hirayama) data set and French (Kauffman) data sets.

One area that does need additional study is the development and testing of better measures of involuntary smoke exposure, such as area and personal air samplers and biological markers of exposure. For example, salivary and urinary cotinine levels. These need to be non-invasive.

V

RESEARCH RECOMMENDATIONS

A. Available data

1. The groups with ongoing studies should be encouraged to use common methods of analysis in addition to any methods they are already employing.

2. The use of standardized methods for obtaining questionnaire and lung function data should be continued. However, questionnaires specifically designed to define disease or symptoms in smokers may not be adequate and new questions capable of eliciting more subtle responses are needed.

3. Where possible, a measure of bronchial reactivity and a measure of an individual's atopic status using skin tests and serum IgE should be included.

4. All possible confounding variables need to be taken into account in any analyses.

5. Measures of exposure such as salivary and urinary cotinine ought to be obtained to validate questionnaire results.

B. New Studies

1. Additional studies are probably required in young children (below five years) to obtain more information about the relationship between passive exposure to tobacco smoke and the incidence of lower respiratory tract infections, the development of symptoms, lung growth and lung function.

2. Improved methods of measuring exposure to both tobacco smoke and other indoor pollutants need to be developed and validated. An example of this is the use of salivary and urinary cotinine.

2023379663

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

VI

SUMMARY AND CONCLUSIONS

A review of the data from the studies which have been carried out or are in progress which address the effect of passive smoking on the respiratory system suggests that the effect varies from negligible to quite small. From this review, it was not possible to determine whether there is a specific group which is at increased risk or what the mechanism of the effect (if any) may be. The data sets which already exist and are presently being collected are large and complex and, not surprisingly, there are differences, although small, in the results, among the data sets discussed at this workshop. These differences may be due to real differences among the populations being studied or may be due to methodologic differences that inevitably occur from study to study, both in the data collection and analysis. A common approach to the analysis may help to answer this question. It seems likely that the existing data sets contain sufficient information to allow some conclusions to be reached on the effect of passive smoking on the respiratory system. New large scale population studies (of subjects above 5 years of age) should probably not be initiated until the existing data sets have been thoroughly evaluated. There is, however, an urgent need for the development and evaluation of non-invasive biological markers of exposure.

2023279664

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

APPENDIX A

DIVISION OF LUNG DISEASES

WORKSHOP ON RESPIRATORY EFFECTS OF INVOLUNTARY SMOKE EXPOSURE: EPIDEMIOLOGIC STUDIES

May 1-3, 1983

Chairman: Sonia Buist

May 1

Welcome	S. Hurd
Smoking and Pulmonary Health - Goals of Workshop	S. Buist
Pulmonary Effects of Passive Smoking	C. Rossiter

May 2

COMMUNITY BASED STUDIES ON THE PULMONARY EFFECTS OF PASSIVE SMOKING

Moderator: S. Buist

Studies from Boston, Massachusetts	I. Tager
	F. Speizer
	S. Weiss
	D. Dockery
	B. Ferris
	B. Rosner
	T. Louis
Studies from Tucson, Arizona	B. Burrows
	M. Lebowitz
	L. Taussig
Studies from Ann Arbor, Michigan	M. Higgins
	I. Higgins
	J. Keller
	A. Monto

OTHER STUDIES AND METHODOLOGICAL ISSUES

Moderator: H. Weill

WHO Studies	M. Lebowitz
Measurement of Indoor Polution	J. Stolwijk

2023279665

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

May 3

GROUP DISCUSSIONS TO DEVELOP RECOMMENDATIONS ON THE FOLLOWING ISSUES

Exposure Measures

Outcome Variables

Confounding Variables

Other Statistical Issues in Design and Analysis

Additional Studies

FINAL PRESENTATIONS AND RECOMMENDATIONS

Moderator: S. Buist

SUMMARIES OF GROUP DISCUSSIONS

RECOMMENDATIONS FOR FUTURE RESEARCH

CONCLUDING REMARKS

2023379666

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

APPENDIX B

PARTICIPANTS

Sonia Buist,M.D.
Professor of Medicine
and Physiology
The Oregon Health Sciences
University
School of Medicine
3181 SW Sam Jackson Park Road
Portland, OR 97201

Benjamin Burrows, M.D.
Professor of Internal Medicine
Division of Respiratory Sciences
The University of Arizona Health
Sciences Center
1501 North Campbell Avenue
Tucson, AZ 85724

John E. Diem, Ph.D.
Professor of Statistics
Program in Applied Statistics
Tulane University
424 Gibson Hall
New Orleans, LA 70118

Douglas Dockery, D.Sc.
Research Associate
Department of Physiology
Building 1, Room 1416
Harvard School of Public Health
665 Huntington Avenue
Boston, MA 02115

BenJamin Ferris, Jr., M.D.
Professor of Environmental Health
and Safety
Department of Physiology
Harvard School of Public Health
665 Huntington Avenue
Boston, MA 02115

Ian Higgins, M.D.
Professor of Epidemiology
University of Michigan
School of Public Health
109 Observatory Street
Ann Arbor, MI 48109

Millicent Higgins, M.D., D.P.H.
Professor of Epidemiology
University of Michigan
School of Public Health
109 Observatory Street
Ann Arbor, MI 48109

Jacob Keller, MPH
Senior Research Associate
University of Michigan
School of Public Health
109 Observatory Street
Ann Arbor, MI 48109

Michael D. Lebowitz, Ph.D.
Professor of Internal Medicine
Division of Respiratory Sciences
The University of Arizona Health
Sciences Center
1501 North Campbell Avenue
Tucson, AZ 85724

Thomas Louis, Ph.D.
Associate Professor
Harvard University
School of Public Health
Department of Biostatistics
677 Huntington Avenue
Boston, MA 02115

Arnold S. Monto, M.D.
Professor of Epidemiology
University of Michigan
School of Public Health
109 Observatory Street
Ann Arbor, MI 48109

Bernard Rosner, Ph.D.
Associate Professor of Preventive
Medicine and Clinical Epidemiology
Channing Laboratory
180 Longwood Avenue
Boston, MA 02115

2023279667

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000

Charles E. Rossiter
Clinical Research Center
Division of Computing and Statistics
Watford Road, Harrow, Middlesex
England HA1 3UJ

Frank E. Speizer, M.D.
Associate Professor of Medicine
Harvard Medical School
Channing Laboratory
180 Longwood Avenue
Boston, MA 02115

Jan A. J. Stolwijk, Ph.D.
Chairman, Department of
Epidemiology and Public Health
Yale University School of Medicine
P.O. Box 3333
60 College Street
New Haven, CT 06510

Ira B. Tager, M.D.
Assistant Professor of Medicine
Beth Israel Hospital
330 Brookline Avenue
Boston, MA 02215

Lynn M. Taussig, M.D.
Professor, Department of
Pediatrics
The University of Arizona Health
Sciences Center
1501 North Campbell Avenue
Tucson, AZ 85724

Mike Wall, M.D.
Assistant Professor of Pediatrics
Division of Chest Diseases
The Oregon Health Sciences
University
School of Medicine
3181 SW Sam Jackson Park Road
Portland, OR 97201

Hans Weill, M.D.
Professor of Medicine
Tulane University School of Medicine
1700 Perdido Street
New Orleans, LA 70112

Scott T. Weiss, M.D., M.S.
Associate Chief, Pulmonary Unit
Beth Israel Hospital
330 Brookline Avenue
Boston, MA 02215

Margaret Wu, Ph.D.
Biometric Research Branch,
Division of Heart and Vascular
Diseases
National Heart, Lung, and Blood
Institute
Bethesda, MD 20205

Division of Lung Diseases Staff
National Heart, Lung, and Blood Institute

Suzanne S. Hurd, Ph.D.
Acting Director

J. Sri Ram, Ph.D.
Chief, Airways Diseases Branch

Zakir H. Bengali, Ph.D.
Airways Diseases Branch

Hannah H. Peavy, M.D.
Airways Diseases Branch

2023279668

Source: https://www.industrydocuments.ucsf.edu/docs/zxnx0000